IMAGING ELEMENT AND IMAGING DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a national stage application under 35 U.S.C. 371 and claims the benefit of PCT Application No. PCT/JP2014/057704 having an international filing date of Mar. 20, 2014, which designated the United States, which PCT application claimed the benefit of Japanese Patent Application No. 2013-073532 filed Mar. 29, 2013, the disclosures of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

The present disclosure relates to an imaging element having a focus detecting function and an imaging device including the imaging element.

BACKGROUND ART

Video cameras, digital still cameras, etc. utilize semiconductor imaging devices (imaging devices) configured of image sensors such as CCD (Charge Coupled Device), CMOS (Complementary Metal-Oxide Semiconductor), etc. In these imaging devices, each element is provided with a light receiving section including a photodiode. In the light receiving section, entering light is photoelectrically converted to generate signal charges.

In recent years, there has been developed a system (an imaging surface phase difference detection system) in which some of imaging pixels in the imaging device are used for phase detection so as to increase an automatic focusing (AF) speed. The phase difference detection system involves focus detection of a pupil division system with use of a two-dimensional sensor in which each pixel of an image sensor is provided with an on-chip lens.

In such an imaging device, some reports have been made on techniques to attain light receiving characteristics expected in pixels for imaging (imaging pixels) and in pixels for focus detection (imaging surface phase difference pixels). For example, an imaging device is disclosed in which curvatures of on-chip lenses are varied, or a placement surface of the on-chip lens is allowed to be at a different level, pixel by pixel, in a direction of an optical axis, so as to adjust a condensing point of entering light (for example, refer to Patent Literatures 1 and 2). Also, an imaging device is disclosed in which an element isolation layer made of a non-transparent conductive material is provided on a rear surface side of a silicon substrate on a light entering side, allowing for improvement in both pupil division performance and sensitivity (for example, refer to Patent Literature 3). Furthermore, an imaging device is disclosed in which one on-chip lens is assigned to a plurality of imaging surface phase difference pixels whose light receiving surfaces are allowed to be at a different level (for example, refer to Patent Literature 4).

CITATION LIST

Patent Literature

Patent Literature 1: JP 2008-522245W
Patent Literature 2: JP 2011-54350A
Patent Literature 3: JP 2012-84816A
Patent Literature 4: JP 2008-71920A

SUMMARY OF INVENTION

However, varying the curvatures of the on-chip lenses or allowing light receiving surfaces of the imaging pixels to be at a different level from those of the imaging surface phase difference pixels may cause a disadvantage of occurrence of color mixture due to obliquely entering light through adjacent pixels, in spite of improvement in AF characteristics.

It is therefore desirable to provide an imaging element and an imaging device that make it possible to improve phase difference detection accuracy while restraining color mixture between adjacent pixels.

An imaging element according to an embodiment of the present technology includes: a first pixel and a second pixel each including a light receiving section and a light condensing section, in which the light receiving section includes a photoelectric conversion element, and the light condensing section is configured to allow entering light to be condensed toward the light receiving section; a trench provided between the first pixel and the second pixel; a first light shielding film embedded in the trench; and a second light shielding film provided on part of a light receiving surface of the light receiving section of the second pixel, in which the second light shielding film is continuous with the first light shielding film.

An imaging device according to an embodiment of the present technology includes the above-described imaging element according to the present technology.

In the imaging element according to the above-described embodiment of the present technology, the first pixel (an imaging pixel) and the second pixel (an imaging surface phase difference pixel) each includes the light receiving section and the light condensing section. The light receiving section includes the photoelectric conversion element. The light condensing section is configured to allow entering light to be condensed toward the light receiving section. Between the adjacent pixels, i.e., the first pixel and the second pixel, provided is the trench in which the first light shielding film is embedded. The first light shielding film is formed continuously with the second light shielding film provided on part of the light receiving surface of the second pixel. This allows for reduction in inter-pixel crosstalk caused by obliquely entering light, while allowing entering light in the second pixel to be condensed at a position where the second light shielding film is formed.

According to the imaging element according to the embodiment of the present technology, the trench is provided between the first pixel and the second pixel. The first light shielding film is embedded in the trench. The first light shielding film is continuous with the second light shielding film provided on part of the light shielding surface of the second pixel. This allows for reduction in crosstalk caused by obliquely entering light through adjacent pixels, while allowing entering light in the second pixel to be condensed at a position where the second light shielding film is formed. Hence, it is possible to improve phase difference detection speed while restraining color mixture between adjacent pixels.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a cross-sectional view of an image sensor according to a first embodiment of the present disclosure.

FIG. **2** is a plan view of the image sensor illustrated in FIG. **1**.